BCDC Commission Meeting
San Francisco-Oakland Bay Bridge
Pier E3 Demonstration Project
September 17, 2015

BCDC Exhibit B

California Department of Transportation

Dr. Brian Maroney – Toll Bridge Program Chief Bridge Engineer

Ste[illegible]er

SFOBB Project Background & Updates

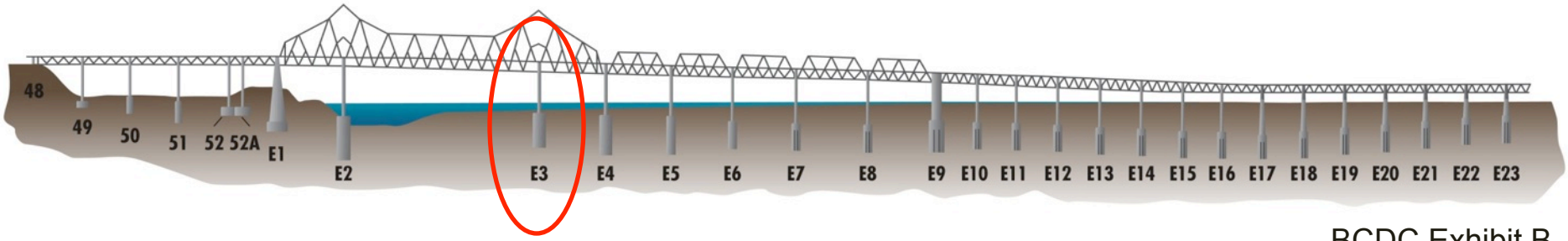
- Project EIS – Finalized in 2001 (CEQA Exempt)
- Regulatory Authorizations Issued in 2001
- Permitting for Pier E3 Demonstration began in 2013
- Restoration of ~17,000 cubic yards of open water from the removal of Pier E3

SFOBB Project Background & Updates

- New east span opened in 2013
- Dismantling split into multiple contracts:
  - YBITS-2
  - 504/288
  - Marine Foundations

Dismantling Contracts

Pier E3 Demonstration Project Status



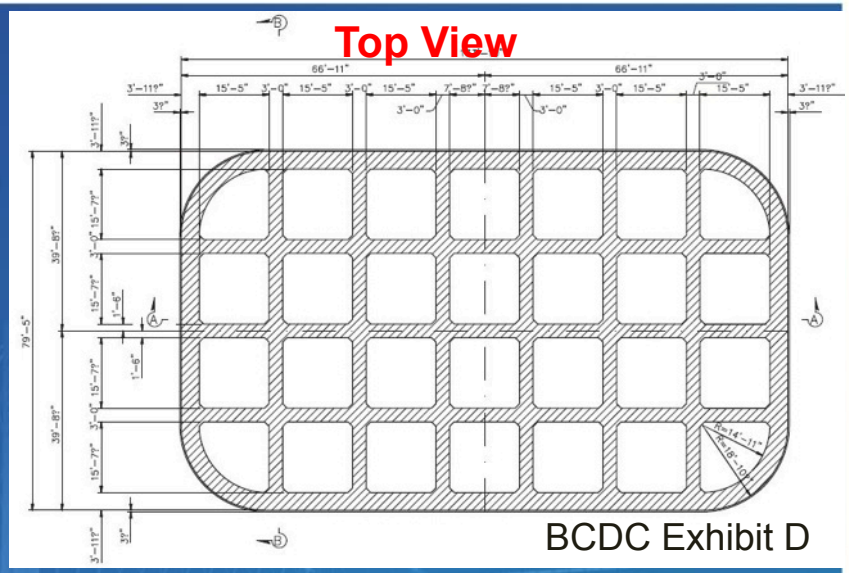
BCDC Exhibit B

Pier E3 Demonstration Project Status

Description of Pier E3

Side View Looking East

Side View Looking North



BCDC Exhibit D

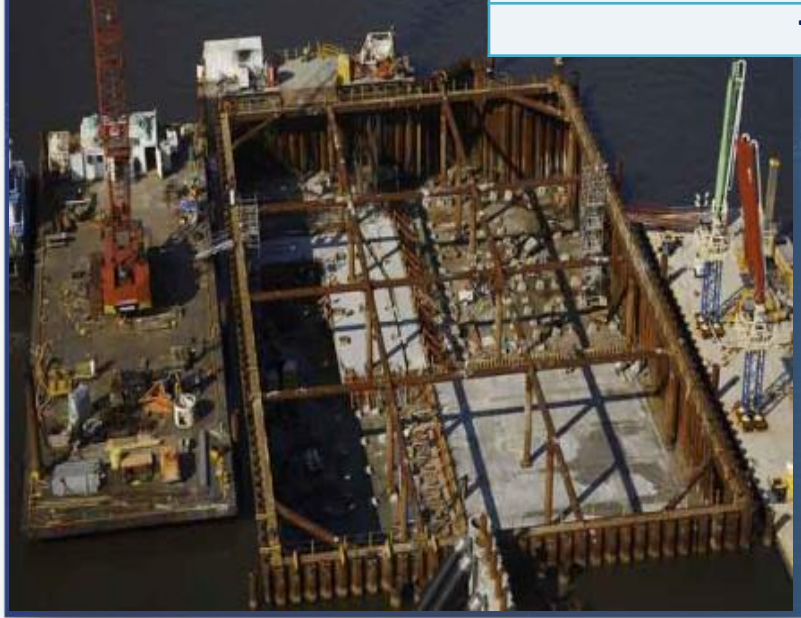
BCDC Exhibit E

Pier E3 Alternatives Analysis:
Dismantling vs Implosion

BCDC Exhibit F

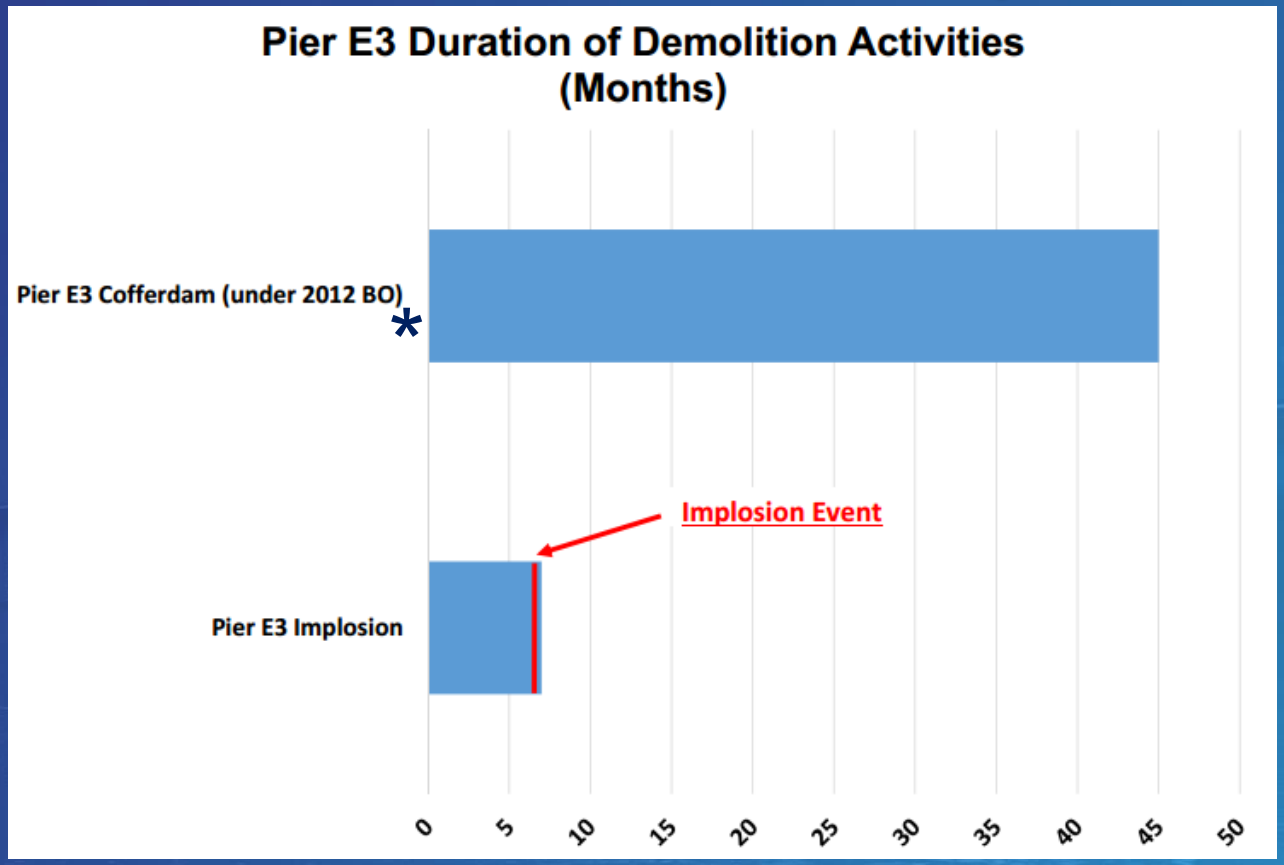
Cofferdam	Estimated # Piles
54" Pipe Piles	36
24" Pipe Piles	18
King Piles (H-Piles)	170
Sheet Piles	170
Total	**394**

Cofferdam



Alternatives Analysis

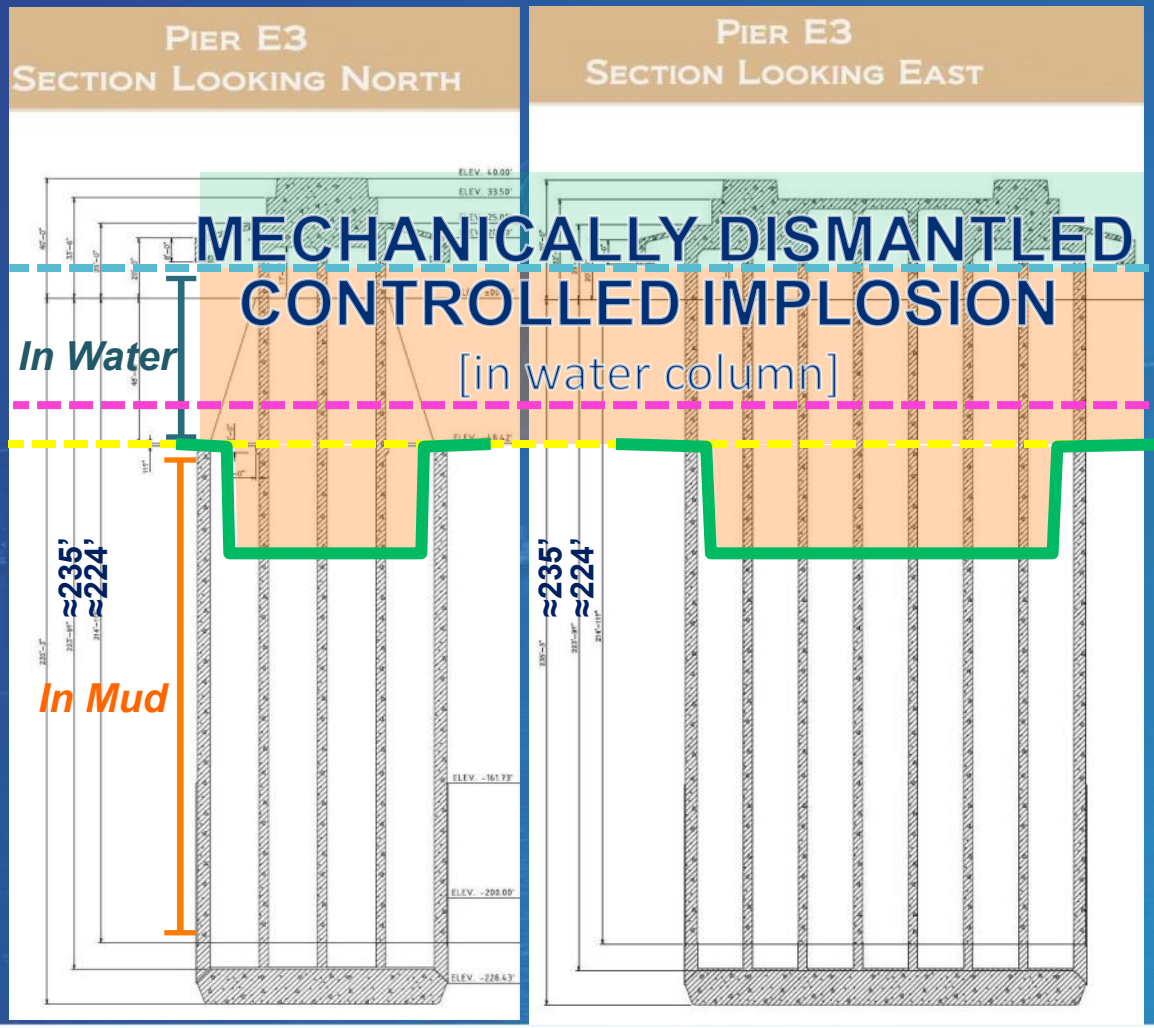
BCDC Exhibit G



*Estimate only covers construction of cofferdam under constraints of 2012 BO

Mechanical dismantling not included in duration

Depth/Elevation of Removal



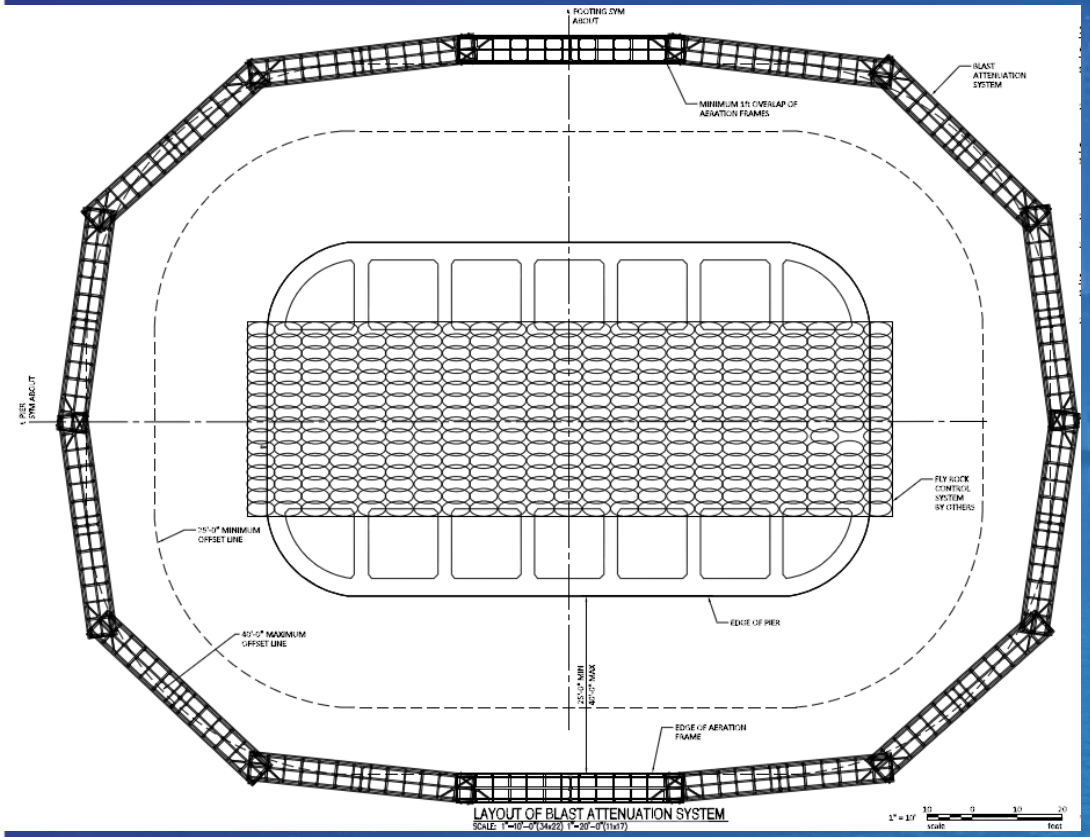
Original Mudline [-40']

Scoured Mudline & Removal Elevation [-51']

Implosion Limit [-77']

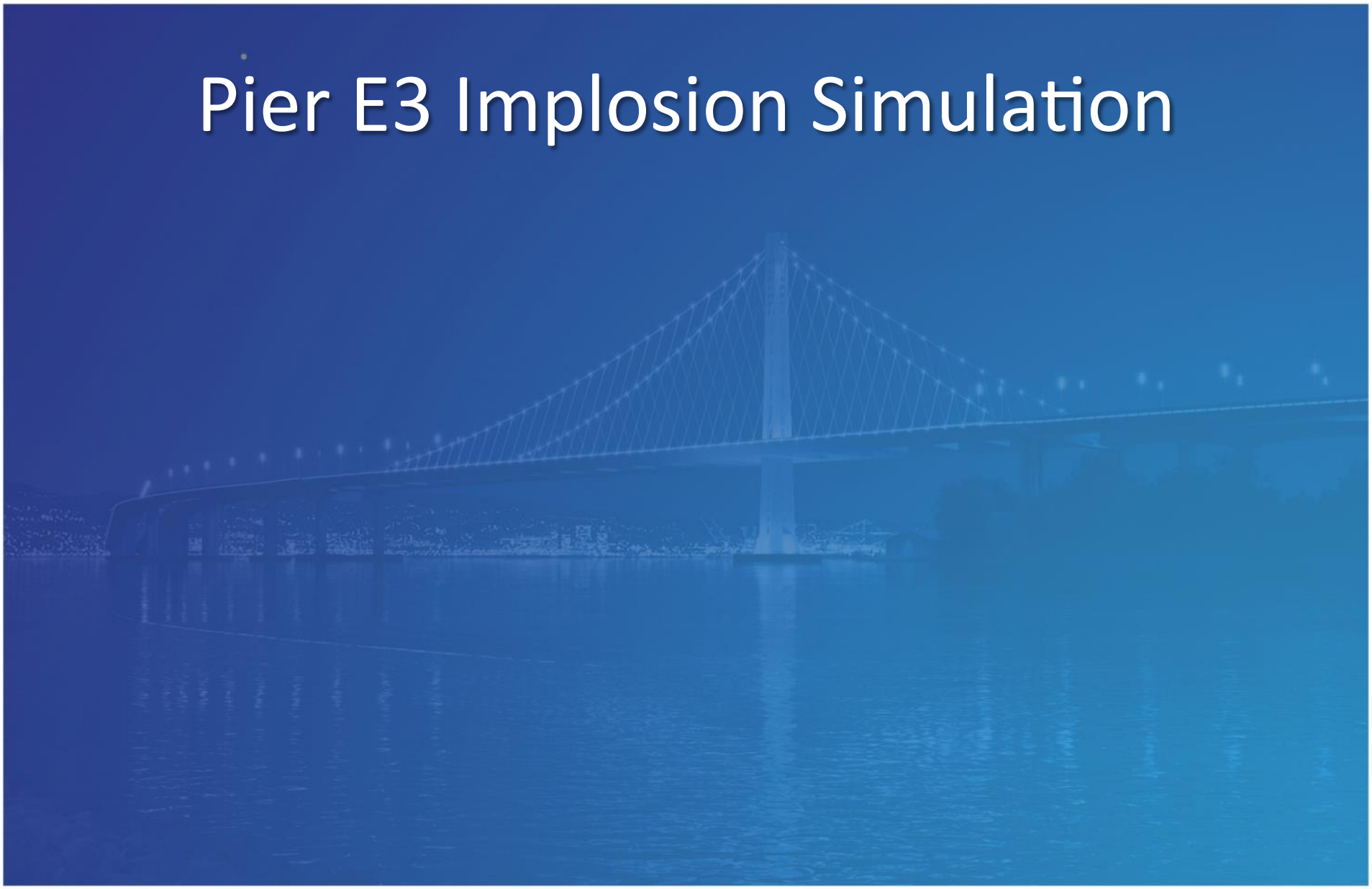
BCDC Exhibit H

Blast Attenuation System



BCDC Exhibit I

Pier E3 Implosion Simulation



Pier E3 Blast Plan Review

Design and Quality Control/Check

KIEWIT/MANSON, AJV

Contract Drilling & Blasting LLC

Quality Assurance/Independent Review

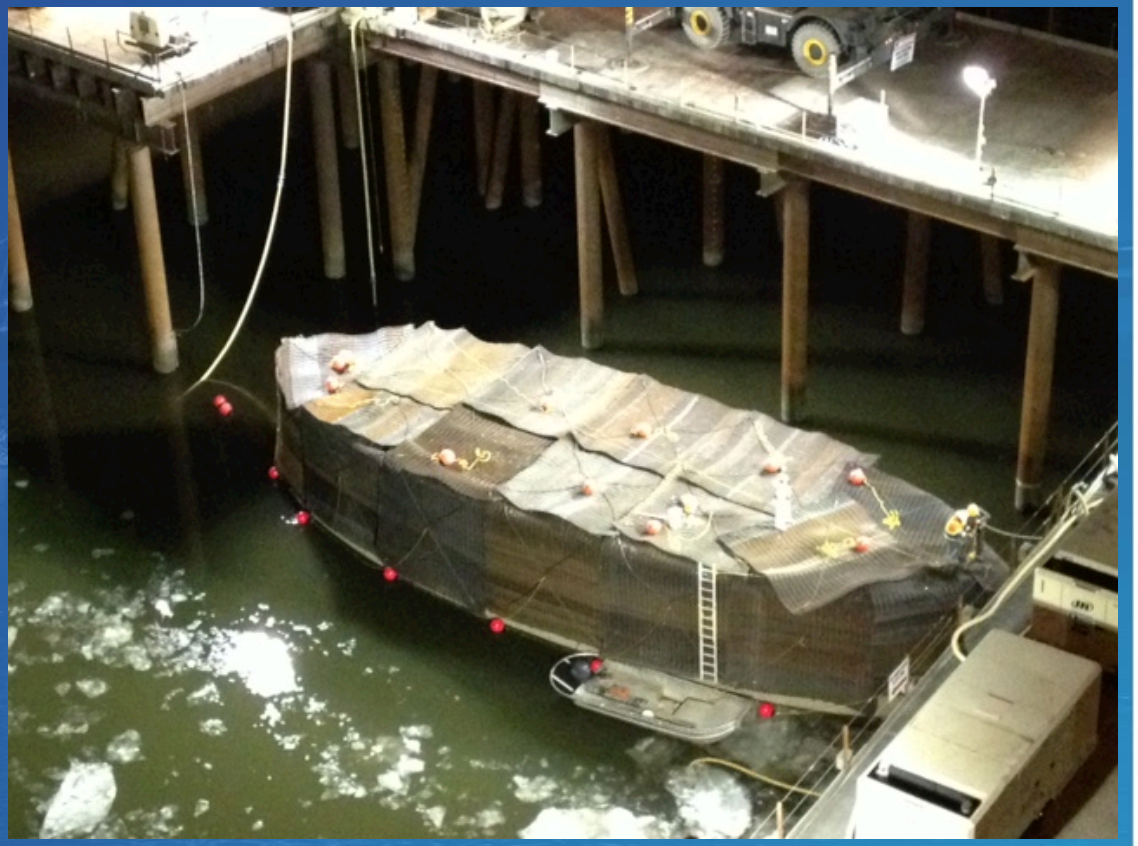
Earth Mechanics, Inc.
Geotechnical & Earthquake Engineering

Caltrans

ENGINEERED EXPLOSIVE SERVICES, LLC

Other Projects Using In-Water Controlled Blasting

- Port Mann
- Lower Mattagami
- Point DuBois



Port Mann – Vancouver, BC, Kiewit

Biological Resources

BCDC Exhibit K

Implosion Scheduled for November

	J	F	M	A	M	J	J	A	S	O	N	D
Harbor Seal			■	■	■	■	■				■	
California Sea Lion			■	■	■	■	■				■	
Elephant Seal	■	■	■								■	■
Gray Whale	■	■				■	■	■	■	■	■	■
Longfin Smelt				■	■	■				■	■	■
Pacific Herring	■	■									■	■
Salmonids	■	■							■	■	■	■
Green Sturgeon[1]	■	■	■	■	■	■	■	■	■	■	■	■
Nesting Birds	■								■	■	■	■
Listed Diving Birds							■	■	■	■	■	

[1] Green Sturgeon have potential to occur around Pier E3 year-round, but in very low densities

Optimal times for Pier E3 blast based on presence of biological resources.

■ Green boxes are months when a species is not expected around Pier E3 or at low densities.

BCDC Exhibit L

Bird Protection

Potential Impacts

- Pressure waves (if diving)

Avoidance and Minimization Measures

- Establish 500'Exclusion Zone for Listed Diving Birds:
  - CA Least Tern (CESA – Endangered)
  - Brown Pelican (CFGC – Fully Protected)
- Avian Biologists will monitor for species
- Deter diving birds prior to implosion
- Implosion delayed if listed species dive into Exclusion Zone

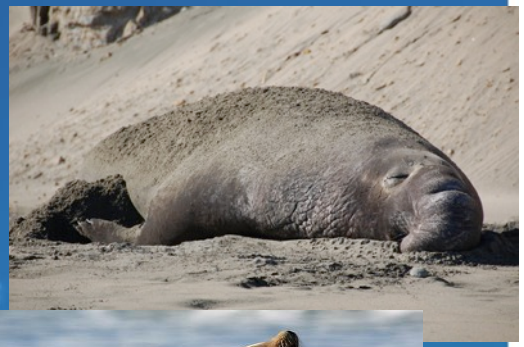
Pier E3 Avian Deterrents

Direct: Human presence

Auditory: Sound Cannons

Visual: Lasers/lights

Marine Mammals



Federal Regulations

NOAA NMFS-Incidental Harassment Authorization

Level A Harassment - Potential for permanent hearing loss, injury or death

Level B Harassment - Potential behavioral impacts or temporary hearing loss (no injury)


Marine Mammal Exclusion Zones
Sea Lion Exclusion Zone (470 ft)
Harbor Seal Exclusion Zone (1,160 ft)
Elephant Seal Exclusion Zone (5,700 ft)
Legend
Elephant Seal Exclusion Zone
Harbor Seal Exclusion Zone
Marine Mammal Monitor
Sea Lion Exclusion Zone
Seal Acoustic Deterrent Device
Pier E3
470’
1160’
5700’
N
1 mi
Google earth

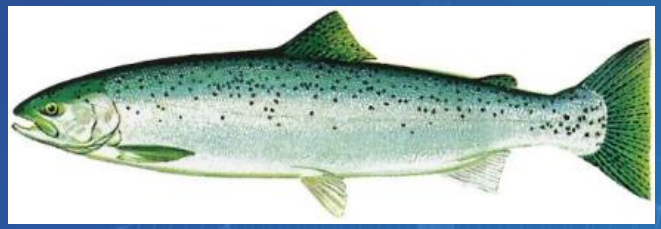

Harbor Porpoise Exclusion Zone
26,500 ft
Legend
Harbor Porpoise Acoustic Deterrent Device
Harbor Porpoise Exclusion Zone (North of Pier E3)
Harbor Porpoise Exclusion Zone (South of Pier E3)
Marine Mammal Monitor
Marine Mammal Monitor & Acoustic Monitoring Equipment
26,500'
Pier E3
26,500'
Google earth
Data CSUMB SFML, CA OPC
N
6 mi

Protected Fish Species

Chinook Salmon

36 inches

Steelhead



Up to 45 inches

Coho Salmon

28 inches

Green Sturgeon

7 feet (84 inches)

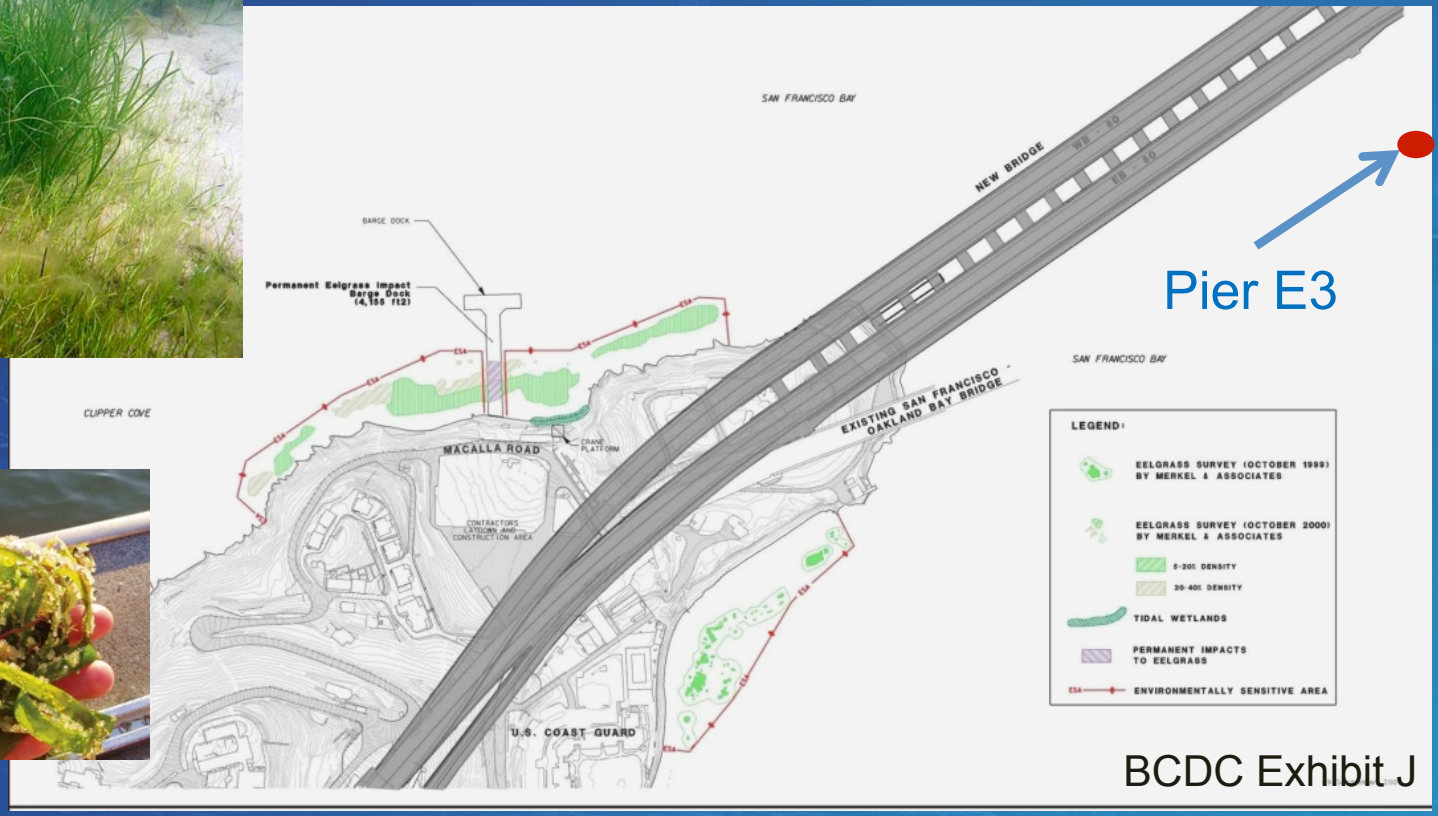
Longfin Smelt

3 inches

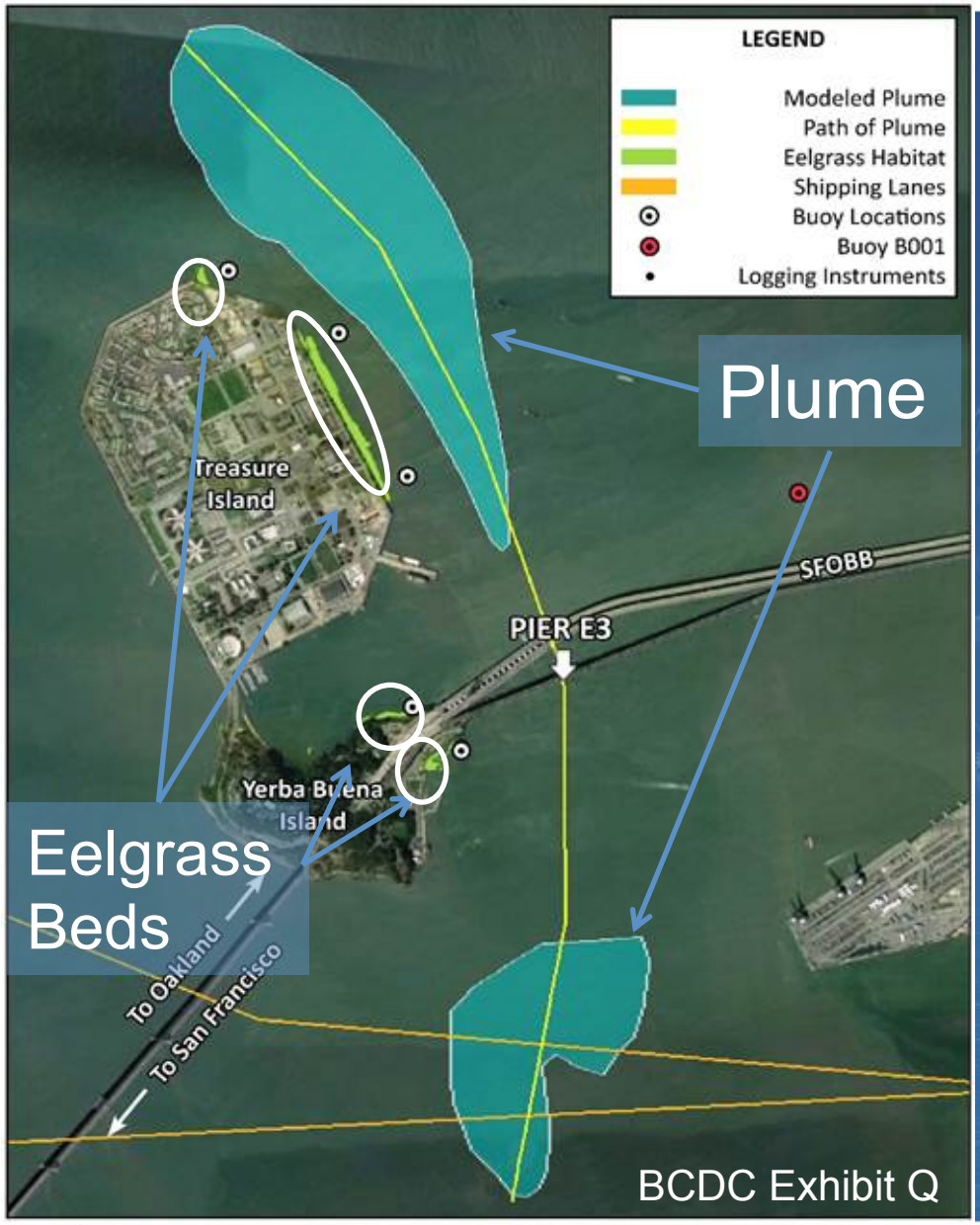
BCDC Exhibit N


SFOBB Pier E3
Fish Hydroacoustic Thresholds
80% Attenuation BAS
80
Pier E3
206dB Peak - 820'
187dB SEL - 2,550'
183dB SEL - 4,000'
BCDC Exhibit O

Critical & Essential Fish Habitat



BCDC Exhibit J



Water Quality

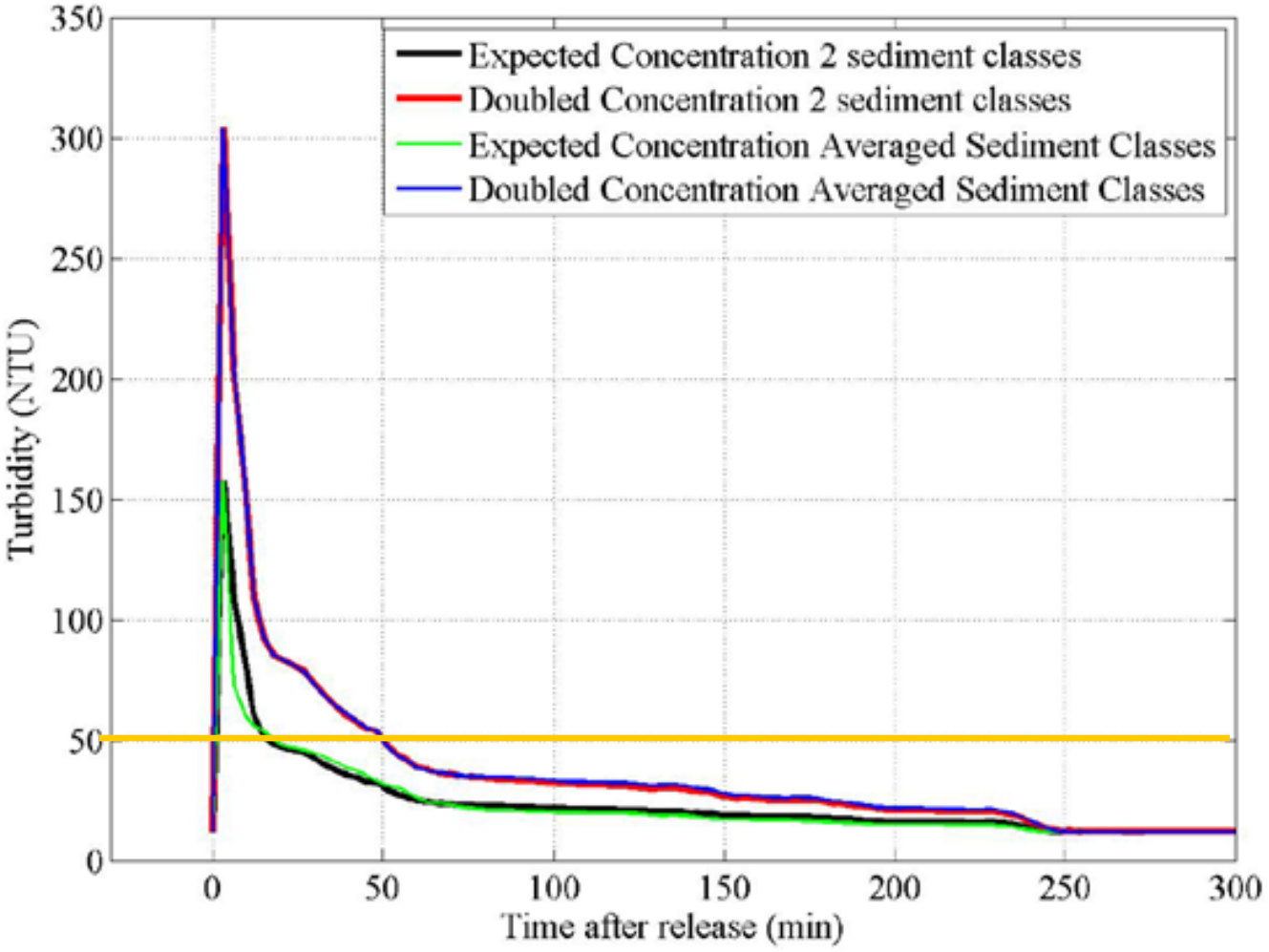
Transient → No Permanent Impacts Anticipated

- Temporary Impacts
  - ↑ pH from implosion of concrete
  - ↑ Turbidity from disturbing bay sediment
- Extensive Monitoring Program
  - Sediment: pH, Toxicity
  - Plume Mapping
  - Water Quality Grab Samples

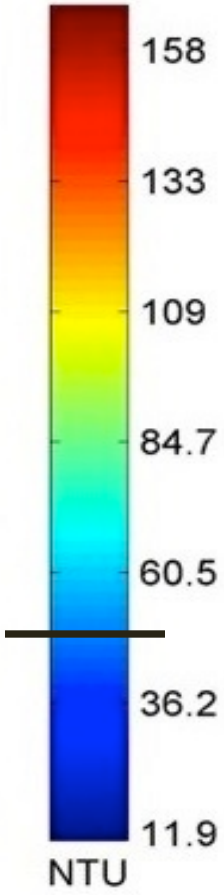
Expected Turbidity Drop-off

— - Water Quality Objectives per RWQCB WDRs, Board Order No. R2-2002-0011

NTU = Nephelometric Turbidity Unit - measures turbidity of water



Spatial Analysis: after detonation

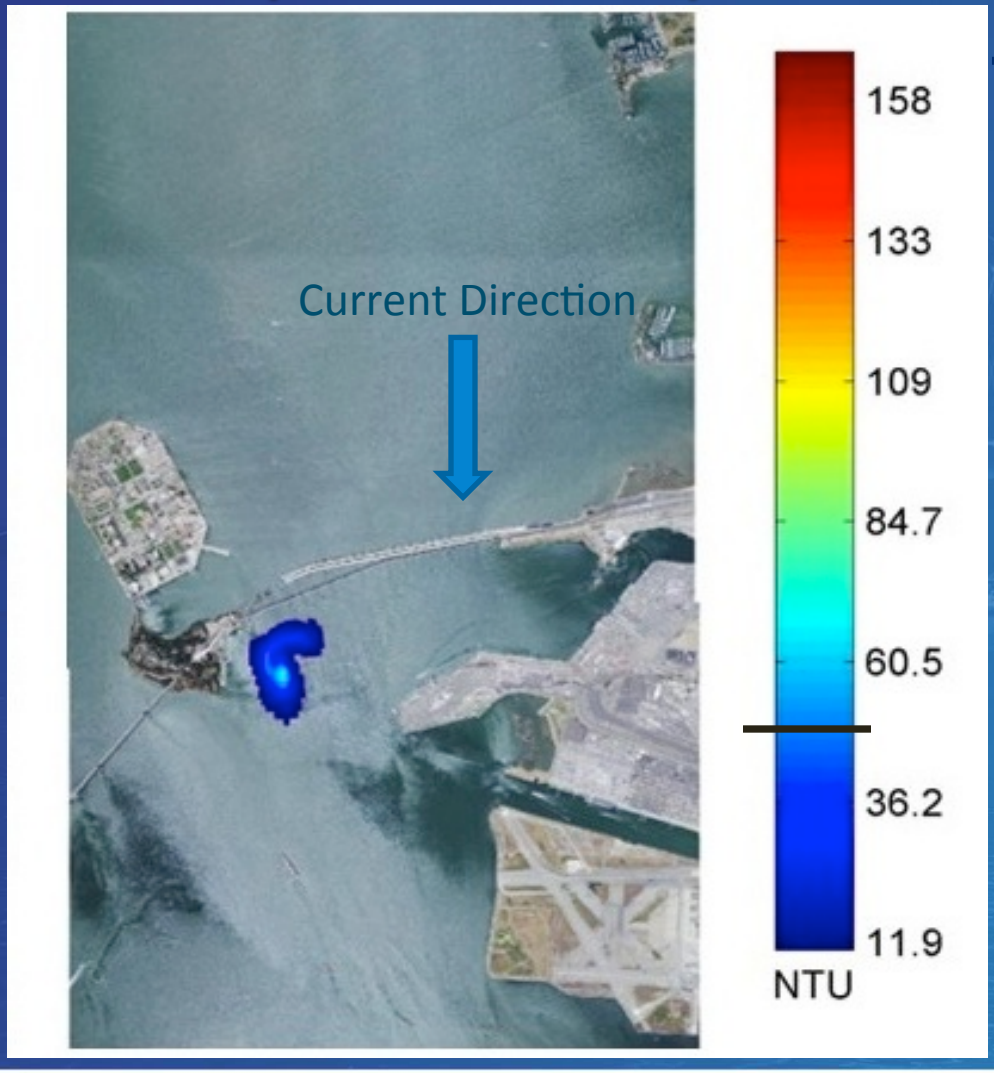


- Water Quality Objectives per RWQCB WDRs, Board Order No. R2-2002-0011

SF Bay Background Range*

* Source: USGS, Pier 17, 2013-present, Oct-Dec

Spatial Analysis: 30 min after

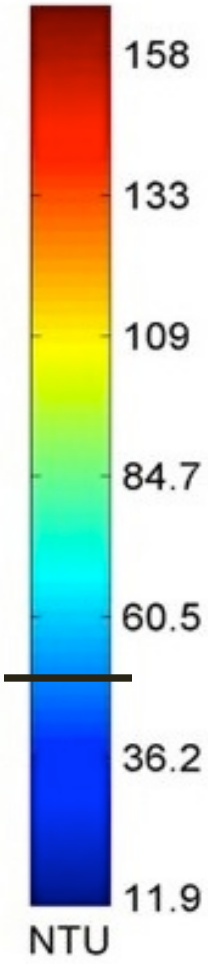


- Water Quality Objectives per RWQCB WDRs, Board Order No. R2-2002-0011

SF Bay Background Range*

* Source: USGS, Pier 17, 2013-present, Oct-Dec

Spatial Analysis: 60 min after

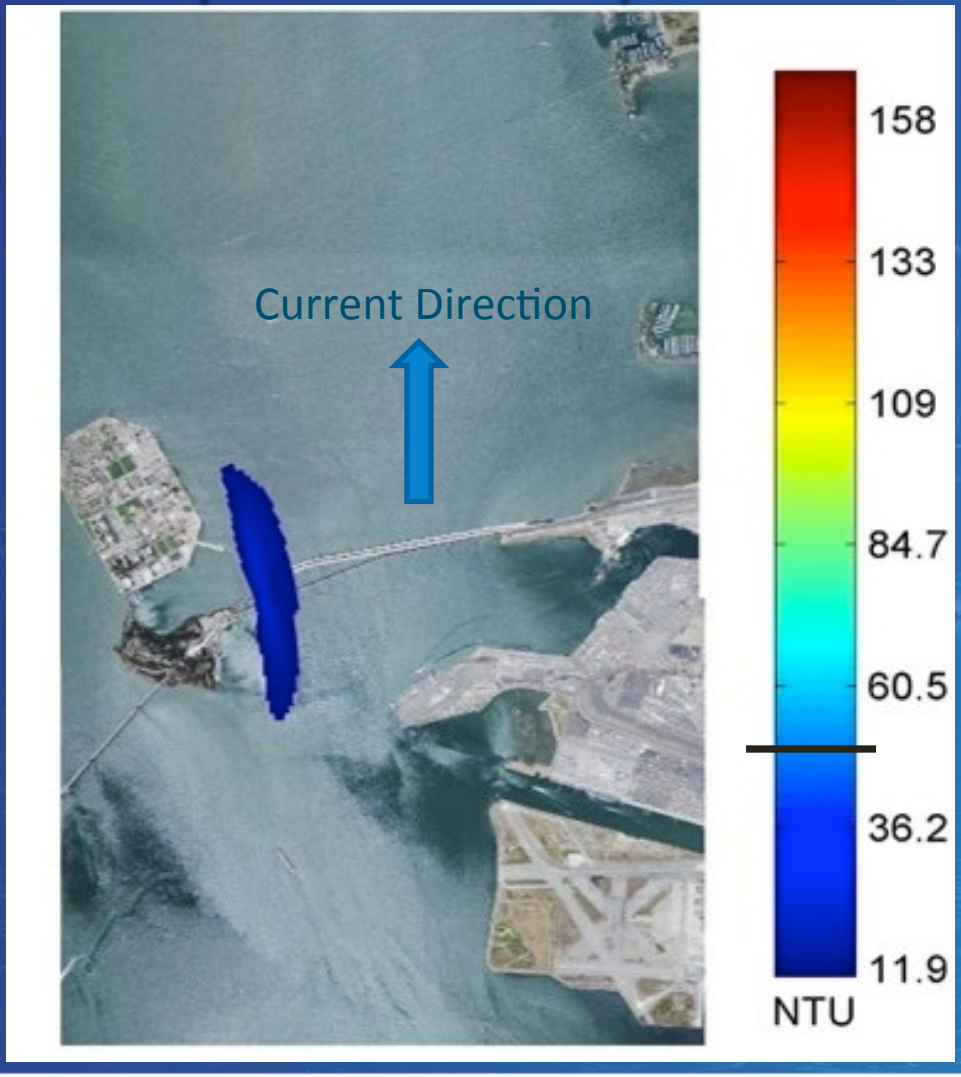


- Water Quality Objectives per RWQCB WDRs, Board Order No. R2-2002-0011

SF Bay Background Range*

* Source: USGS, Pier 17, 2013-present, Oct-Dec

Spatial Analysis: 180 min after

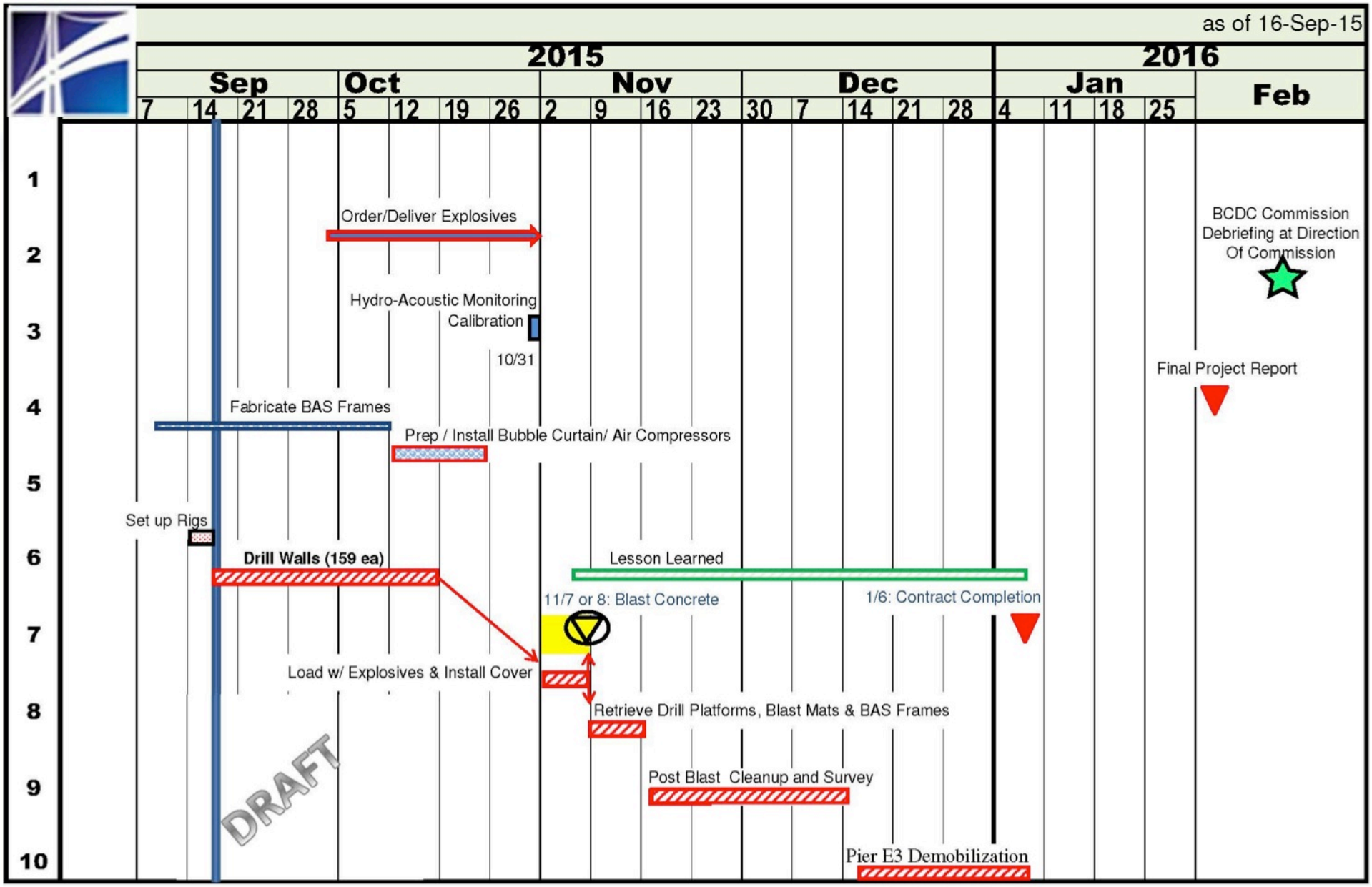


- Water Quality Objectives per RWQCB WDRs, Board Order No. R2-2002-0011

SF Bay Background Range*

* Source: USGS, Pier 17, 2013-present, Oct-Dec

Construction Schedule and Conclusion


as of 16-Sep-15
2015
2016
Sep
Oct
Nov
Dec
Jan
Feb
7 14 21 28 5 12 19 26 2 9 16 23 30 7 14 21 28 4 11 18 25
1
2
3
4
5
6
7
8
9
10
Order/Deliver Explosives
Hydro-Acoustic Monitoring
Calibration
10/31
Fabricate BAS Frames
Prep / Install Bubble Curtain/ Air Compressors
Set up Rigs
Drill Walls (159 ea)
Lesson Learned
11/7 or 8: Blast Concrete
1/6: Contract Completion
Load w/ Explosives & Install Cover
Retrieve Drill Platforms, Blast Mats & BAS Frames
Post Blast Cleanup and Survey
Pier E3 Demobilization
BCDC Commission
Debriefing at Direction
Of Commission
Final Project Report
DRAFT

THANK YOU!

McAteer-Petris Act Section 66605

Restoration of open water to the Bay is considered a public benefit, therefore in compliance with the McAteer-Petris Act

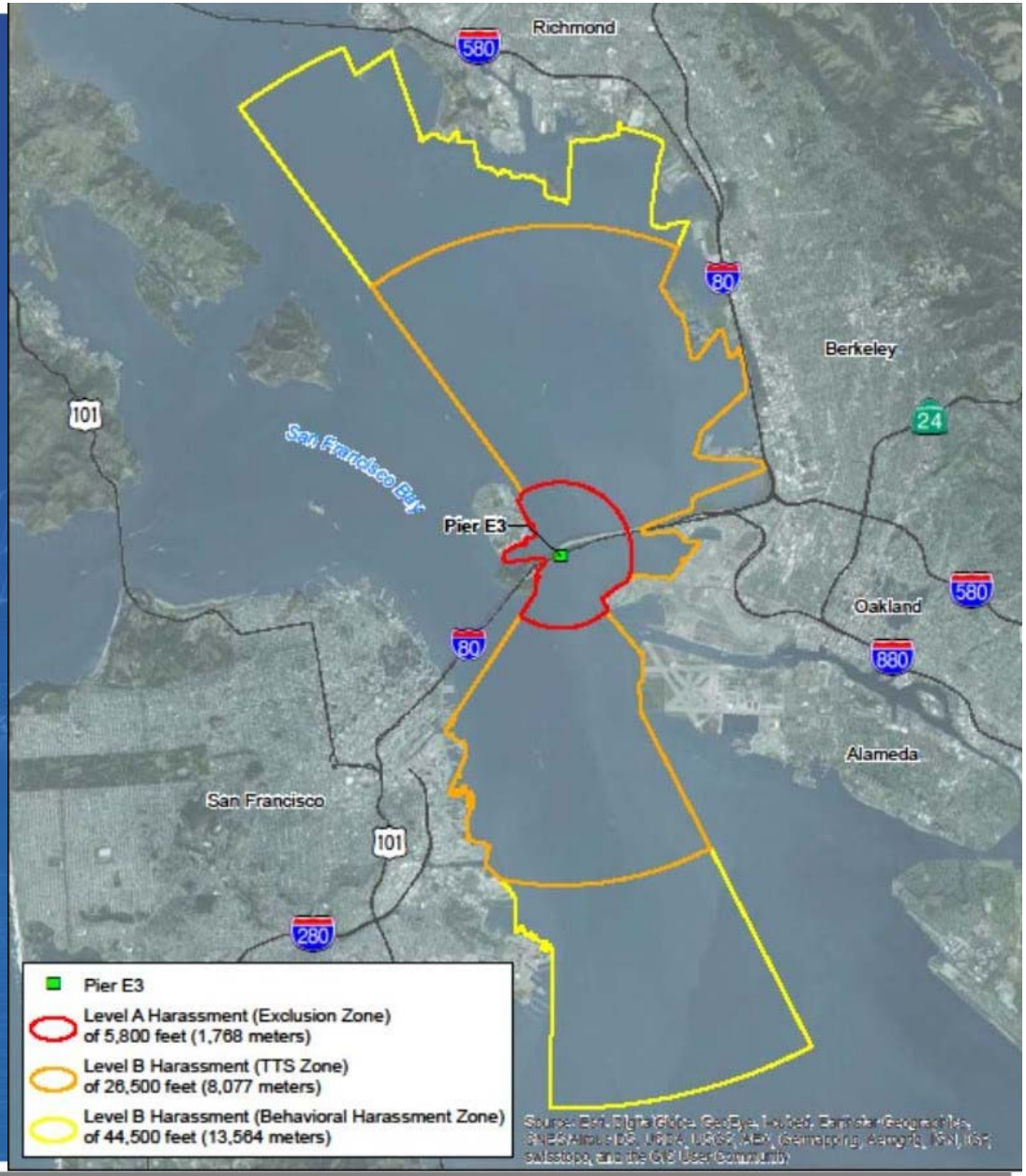
Restoration of 79,000 cubic yards of open water from removal of all marine foundations

Pier E3 alone represents 20% or ~17,000 cubic yards


SFOBB Pier E3
Marine Mammal
Exclusion and
Harassment Zones
Pacific Harbor Seal
Level B Harassment
(Behavioral Harassment)
Zone - 9,700'
Pier E3
Marine Mammal Exclusion Zone - 1,160'
Level B Harassment (TTS) Zone - 5,700'
80
BCDC Exhibit M

Harbor Porpoise Harassment Zones

Level A –Harassment Zone	**5,800 feet**
Level B TTS Harassment Zone	**26,500 feet**
Level B Behavioral Harassment Zone	**44,500 feet**




Richmond-
San Rafael
Bridge
Pier E3
206dB Peak - 820'
187dB SEL - 2,550'
183dB SEL - 4,000'
San Francisco Bay
Pacific
Ocean
San Mateo-
Hayward
Bridge
BCDC Exhibit P
80
580
24
101
880
280
92

California Environmental Quality Act Categorically Exempt

1995 – SB-146 specifies that bridge retrofit projects are categorically exempt under CEQA

1996 – Project received Categorical Exemption from CEQA under California Streets and Highway Code 180.2 and CEQA Section 21080

2005 – AB-144, Point 16 continues the provisions under CEQA for the Toll Bridge Program, which includes the SFOBB project

Alternatives Comparison: Pier E3 Biological and Temporary Fill Impacts

	Hydro-Acoustic Impacts - Fish	Hydro-Acoustic Impacts – Marine Mammals	Impacts - Birds	Temp. Fill in the Bay
1 – Mechanical Dismantling Inside a Cofferdam	Long duration	Long duration	Minimal Difference	Large Amount 45,500yd3 (394 piles + cofferdam)
2 - Controlled Implosion	Short duration, seasonally timed	Short duration, seasonally timed	Minimal Difference	Negligible Amount

	J	F	M	A	M	J	J	A	S	O	N	D
Harbor Seal												
California Sea Lion												
Elephant Seal												
Gray Whale												
Longfin Smelt												
Pacific Herring												
Chinook Salmon[1]												
Green Sturgeon[2]												
Nesting Birds												
Diving Birds												

[1] Juvenile Chinook salmon densities around Pier E3 are low (highest value of 0.25indv/10,000 sq. meters in May

[2] Green sturgeon have potential to occur around Pier E3 year-round, but in very low densities

* Juvenile green sturgeon has potential to be in area, however, only 3 sightings have been observed in over 30 years of monitoring and none were in the month of November.

Environmental Document & Permitting Status

Complete	Pending
RWQCB – SWPPP Amend. 1-4 & 6 (Approved 6/1/15 – 8/24/15)	Revalidation (Draft to be finalized early September)
CDFW ITP Major Amendment (Issued 8/12/15)	NOAA IHA (Draft issued 7/24/15; Final 9/8/15)
NOAA Biological Opinion (Issued 8/27/15)	BCDC Commission Hearing + Vote (9/17/15)
USACE LOM for BAS Test & Drilling (Issued 7/20/15 & 8/26/15)	USACE LOM for Implosion

Pier E3 Blasting Plan Peer Review

Kiewit-Manson JV – Extensive in-water drilling and controlled implosion experience; blasting experts (Ken Tully) with 30+ years experience.

Dr. Gregory Hempen, EMI – Currently resolves the limitations that should be placed on blasting and has recommended to various clients (Corps of Engineers, Tennessee Valley Authority, and other state or private owners of bridges, dams, tunnels and other structures) significant portions of their blasting specifications. Dr. Hempen assesses the mitigation issues from blasting for flyrock, ground vibration or underwater pressure waves, airblast and environmental concerns.

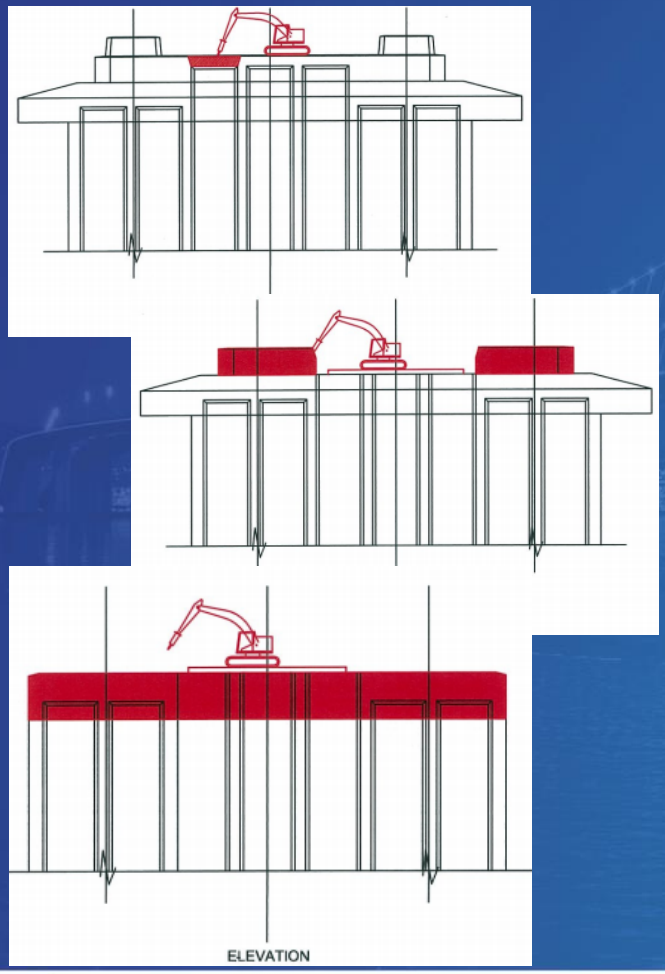
Pier E3 Blasting Plan Peer Review

Dr. Thomas Keevin, EMI – Specialist in Federal Environmental Law and understands the varied organisms being protected. Dr. Keevin evaluated a number of blast pressure mitigation techniques, including field testing bubble-curtain effectiveness using caged fish studies for his Ph.D. dissertation at the University of Illinois.

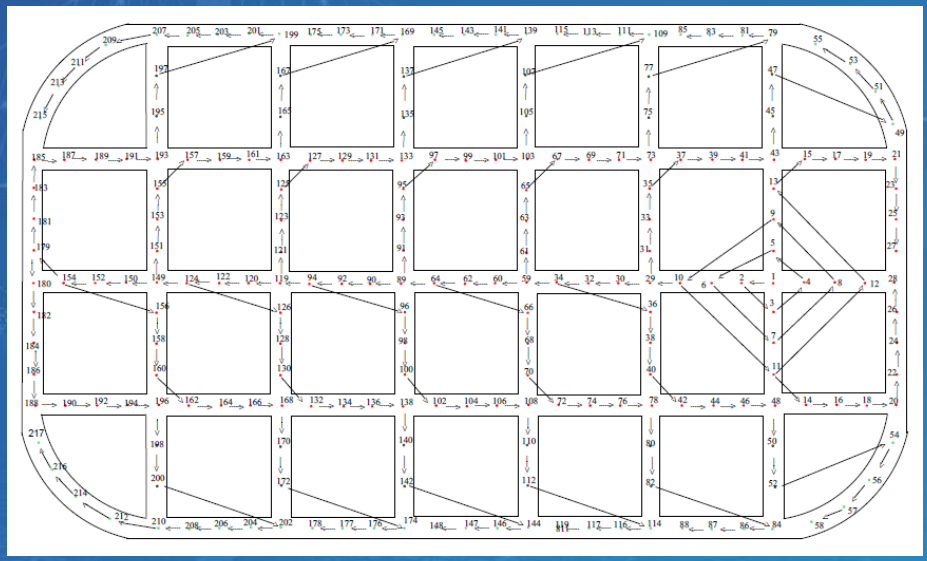
Allen Thompson, EES – Registered civil engineer with 30 years experience in the use of explosives for rock excavation and demolition. Participated as engineer subcontractor for over 40 major projects uding controlled blasting.

Pier E3 Controlled Blasting Blast Plan

Side View



Top View



Total Borings: 159

Fish Regulatory Thresholds

FHWG - Technical guidance on hydroacoustic effects to fish from pile driving

Interim Criteria for Injury to Fish [2008]

- 206 dB Peak sound pressure level [SPL]
- 187 dB accumulated Sound Exposure Level [SEL] - Fish > 2 grams
- 183 dB accumulated SEL – Fish < 2 grams
- 150 dB root-mean squared [RMS] – Behavioral (not injurious)

Fish – Methods

Fish Densities

- Calculated for November using SF Bay Study
- 5 year average (08'-12') for all species (except longfin smelt ['09-'13])

Extrapolated to area subject to 206 dB, 187 dB SEL, or 183 dB SEL to determine potential effect

Fish Impact Analysis

Species	November Population (Central / South Bay) - # Individuals	# Individuals Potentially Affected		
		206 dB Peak	187 dB SEL	183 dB SEL
Coho Salmon	0	0	0	N/A
Chinook Salmon	0	0	0	N/A
Steelhead	0	0	0	N/A
Green Sturgeon	0*	0	0	N/A
Longfin Smelt	133,821	132 (0.1%)	1,075 (0.8%)	1,775 (1.3%)
Jacksmelt	5,701,622	381	2,594	3,080
Northern Anchovy	8,359,486	18,938	160,825	197,513
Pacific Herring	301,213	246	1,641	N/A
Pacific Sardine	2,669	0	0	N/A
English Sole	2,053,879	2,658	24,455	24,993

* Juvenile green sturgeon can occur around Pier E3 throughout the year at low densities.

Marine Mammal Regulatory Thresholds

Five functional hearing groups

Low-frequency cetaceans

Mid-frequency cetaceans

High-frequency cetaceans

Phocid pinnipeds

Otariid pinnipeds

Marine Mammals – Methods

Marine Mammal Densities

- Calculated from 14 years of observations during SFOBB Project [harbor seal, sea lion, harbor porpoise]
- 2004-2014 Stranding data from Marine Mammal Center [N. elephant seal]

Extrapolated to area subject to Level B or Level A Harassment to determine exposure

Marine Mammals – Area of Impact

Species	Level B Criteria		Level A Criteria			Mortality
	Behavioral Response	Temp. Threshold Shift (TTS)	Permanent Threshold Shift (PTS)	Gastro-intensinal Tract	Lung Injury	
Pacific Harbor Seal	9,700 ft	5,700 ft	1,160 ft	35 ft	450 ft	205 ft
Northern Elephant Seal	9,700 ft	5,700 ft	1,160 ft	35 ft	450 ft	205 ft
California Sea Lion	800 ft	470 ft	245 ft	35 ft	450 ft	205 ft
Harbor Porpoise*	44,500 ft	26,500 ft	5,800 ft	35 ft	450 ft	205 ft

* Unlikely to occur within area in November. Real-time acoustic monitoring proposed to confirm absence.

Marine Mammal Impact Analysis

Species	Individual Level B Exposures		Individual Level A Exposures*			Individual Mortality Exposure*
	Behavioral Response	TTS	PTS	Gastro-intestinal Tract	Lung Injury	
Pacific Harbor Seal	5.9	3.4	0.2	0	0	0
Northern Elephant Seal	0.5	0.2	0.01	0	0	0
California Sea Lion	0.03	0.01	0	0	0	0
Harbor Porpoise	0.6	0.3	0.03	0	0	0

* No controlled implosion will occur if individuals are within Level A threshold zones

USFWS Bird Thresholds

USFWS Guidance

- Pile-driving effects to marbled murrelets (2012)
- 202 dB SEL = auditory injury
- 208 dB SEL = non-auditory [physical] injury

In-Air Pressure Wave

- High acoustic impedance between air/ water
  - *Underwater sound does not transfer easily into air and vice versa.*
- High frequency attenuates faster than low frequency sound
- E3 implosion's sound/pressure will occur underwater

Critical Habitat Analysis

- Temporary Effects to:
  - 230 acres of Central valley steelhead and Chinook salmon critical habitat [Area north of original SFOBB subject to 187 dB SEL]
  - 470 acres of Central CA coast steelhead & green sturgeon critical habitat [Area around Pier E3 subject to 187 dB SEL]
- Creation of 13,000 cubic meters of pelagic habitat

Essential Fish Habitat Analysis

Temporary Effects to:

- 1,026 acres of Essential Fish Habitat
  [Area around Pier E3 subject to 183 dB SEL]

No anticipated effects to eelgrass from:

- Pressure waves
- Sediment or turbidity plume [Water Quality Study]
- Equipment storage or staging

Port Mann Project – Vancouver, BC

Environmental Regulatory Agencies

- Ministry of the Environment
- Department of Fisheries and Oceans (DFO)
- Transport Canada (Navigable Waters)
- Port Metro Vancouver
- BC Ministry of Forests, Lands, and Natural Resource Operations
- BC Ministry of Environment

Port Mann Demo:
In-Water Pedestal Blast

SFOBB EAST SPAN
FOUNDATION REMOVAL PROJECT

KIEWIT/MANSON, AJV

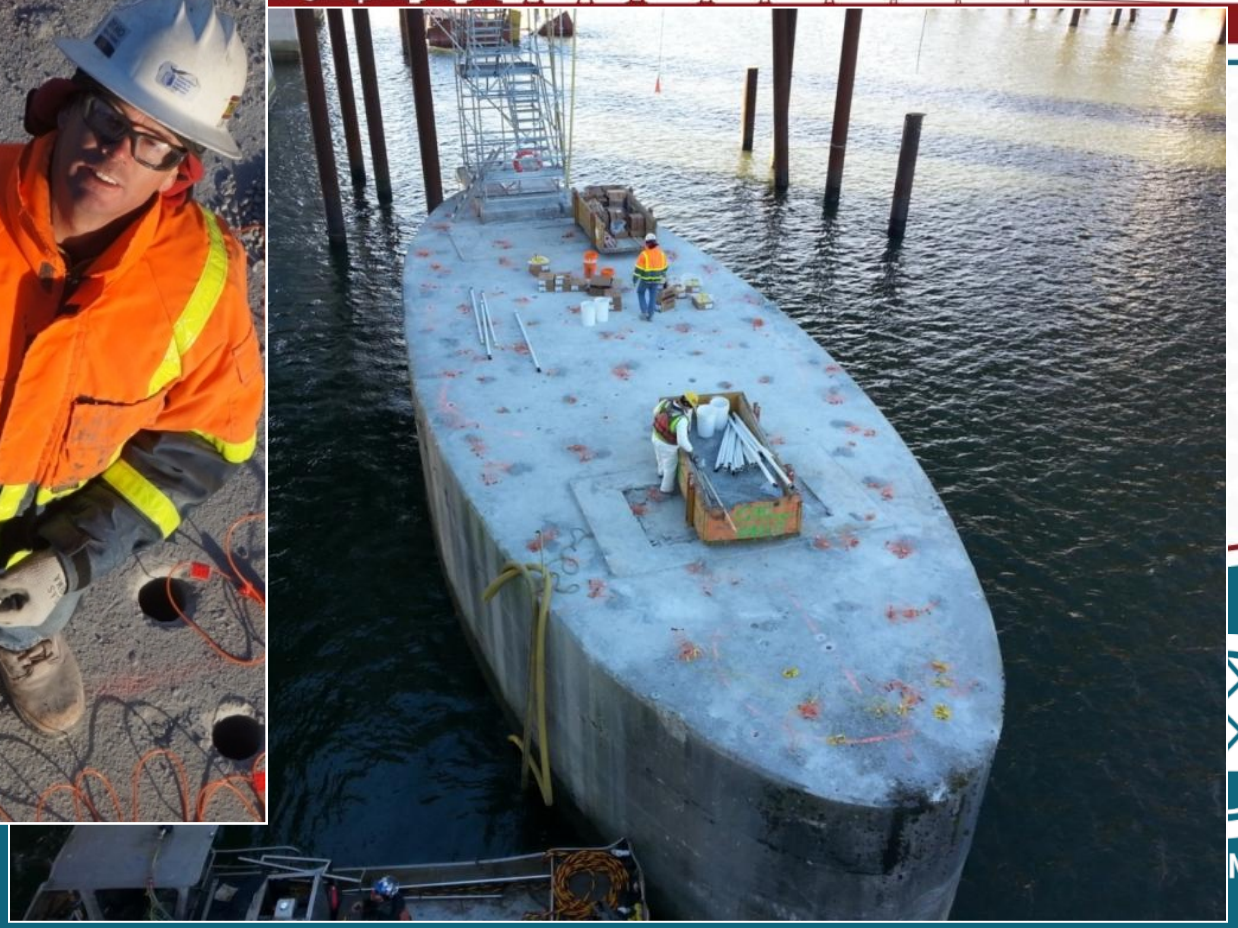
In-Water Piers

Drill & Load Explosives

SFOBB EAST SPAN
FOUNDATION REMOVAL PROJECT

/MANSON, AJV

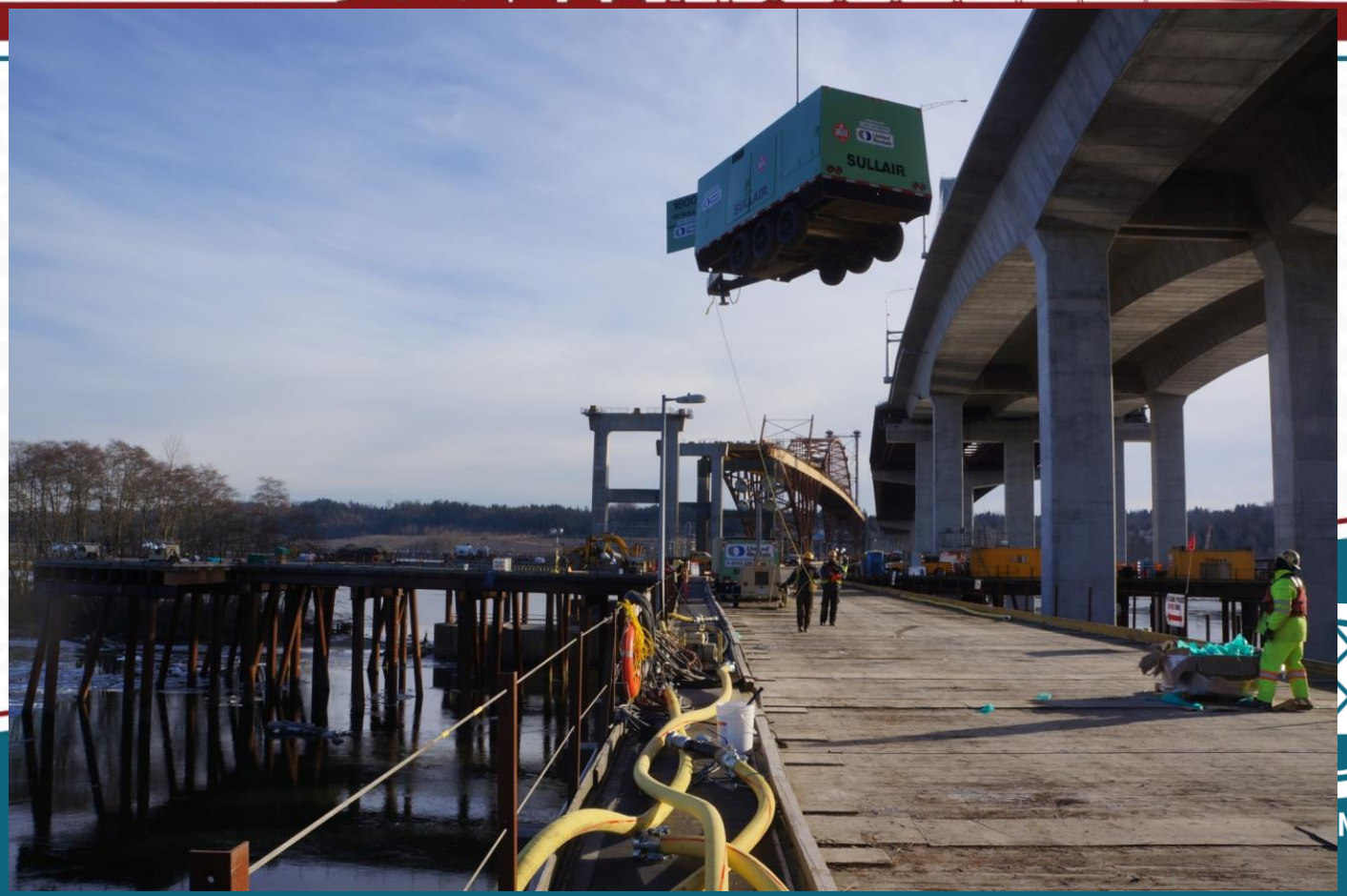
Drill & Load Explosives



Drill & Load Explosives

Blast Attenuation System (BAS) Installation

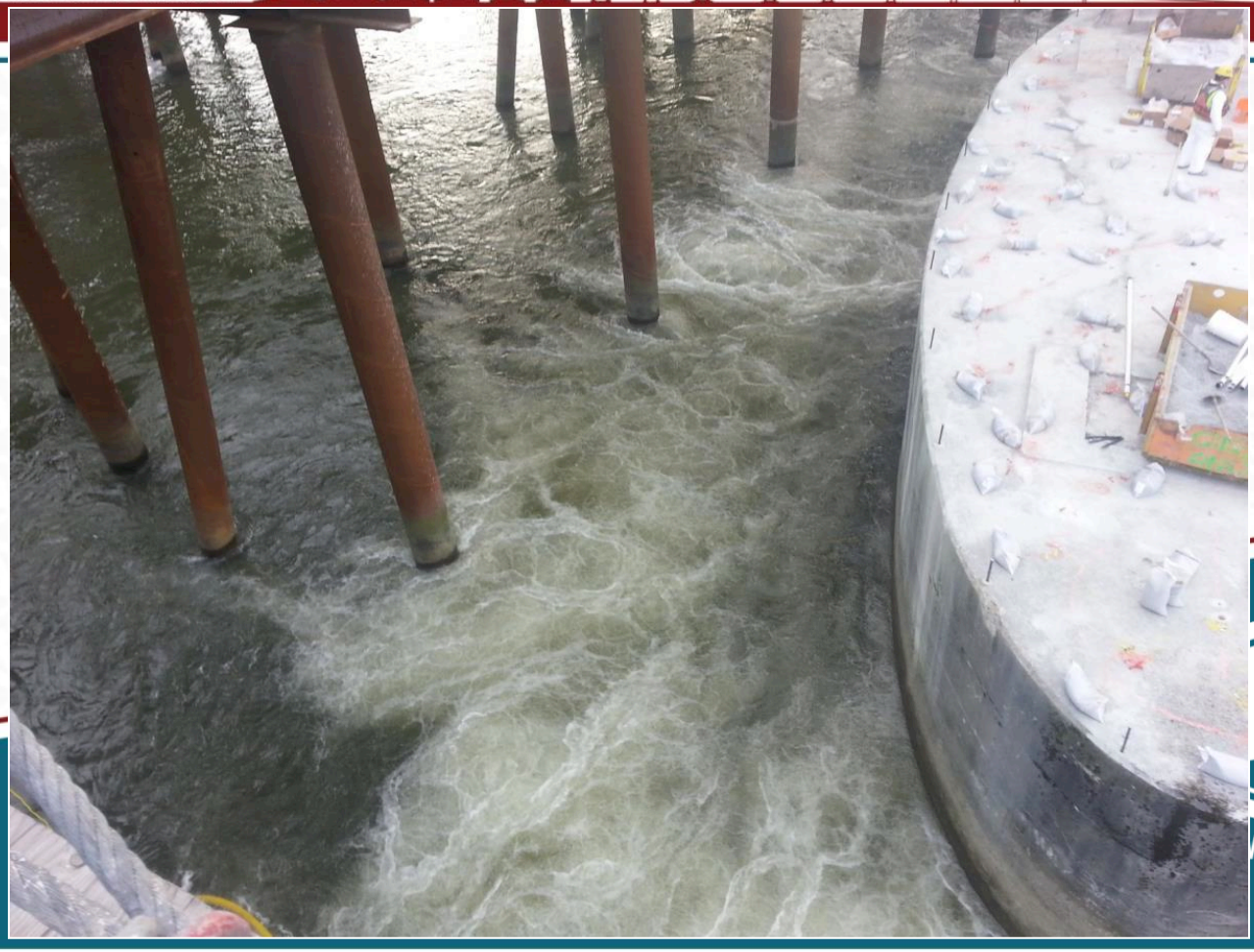
SFOBB EAST SPAN
FOUNDATION REMOVAL PROJECT



NSON, AJV

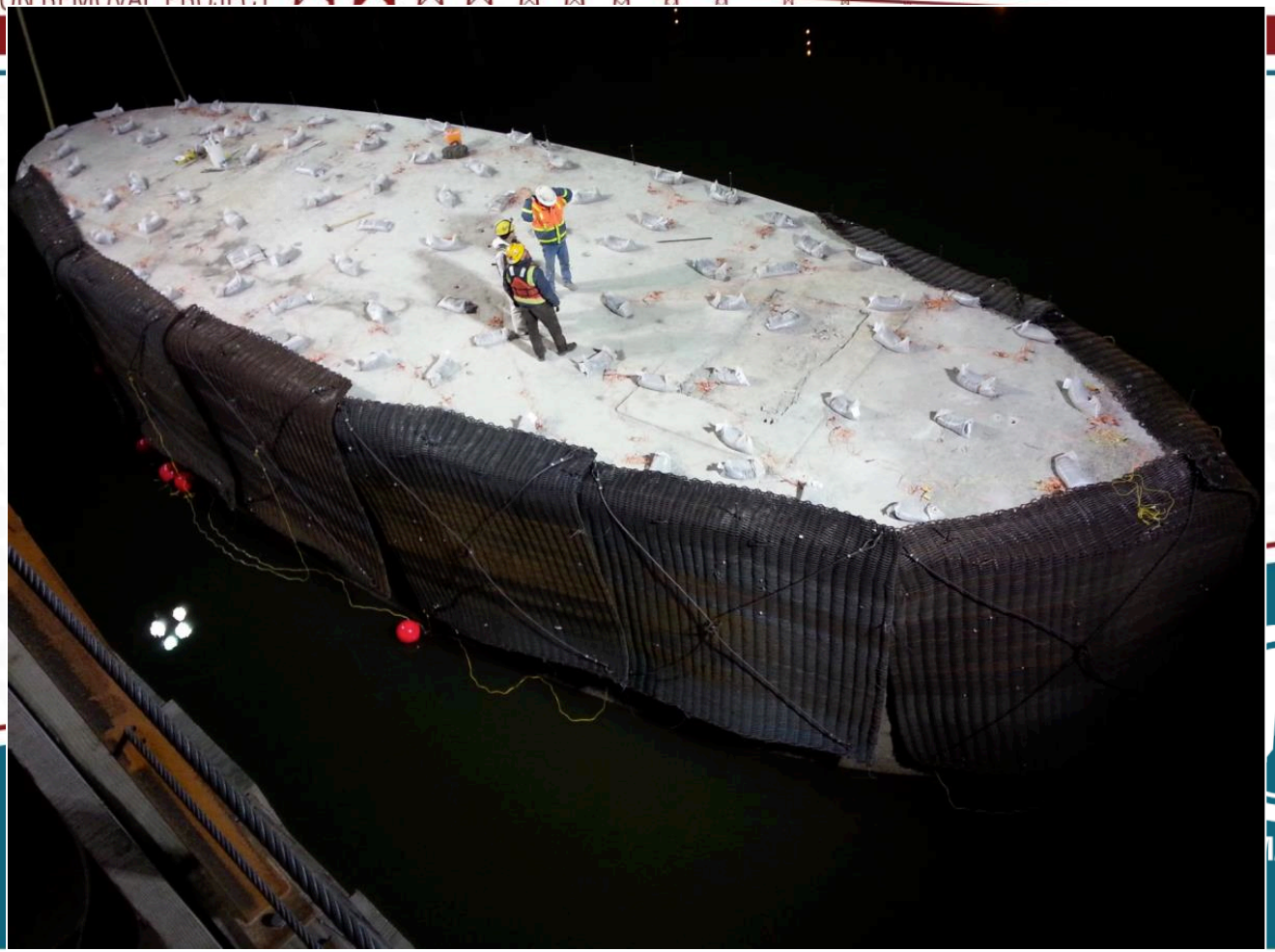
BAS Installation & Testing

SFOBB EAST SPAN
FOUNDATION REMOVAL PROJECT



MANSON, AJV

Blast Mat Installation



Blast Mat Installation

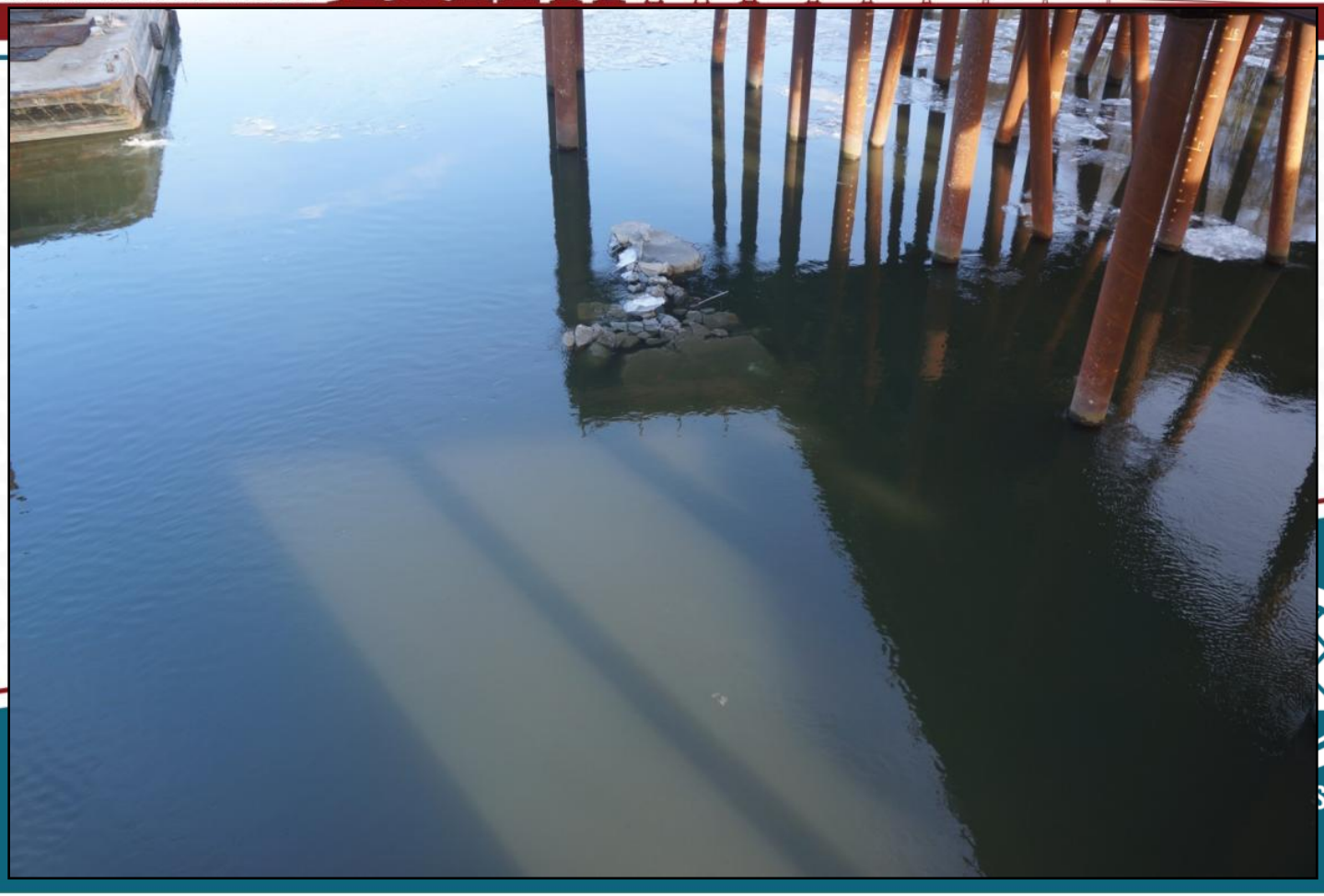
SFOBB EAST SPAN
FOUNDATION REMOVAL PROJECT

NSON, AJV

Pre-Blasting Setup

Post Blast Condition

SFOBB EAST SPAN
FOUNDATION REMOVAL PROJECT



SON, AJV

Blast Rubble Off-Loading

Demonstration Project Phasing

Dismantling of Pier E3 will take place in 4 phases:

Phase	Status
1. Dismantling of pier cap and fender system	Completed August 2015
2. Drilling of bore holes into caisson and buttress walls and installing the Blast Attenuation System (BAS)	Work to start September 8, 2015
3. Installing charges, activating the BAS and imploding the pier	Load Charges – November 1, 2015 Blast – November 7, 2015
4. Management and removal of remaining dismantling debris	November 16-24, 2015